

THE LABORATORY IN 1944

Trade Sales Finishes

Under ordinary conditions, raw materials mean nothing more to the laboratory than basic ingredients for paint making. During the war, however, raw material problems have taken precedence over every other type of laboratory problem because the continuance of our trade sales business has frequently depended upon the speedy solution of these problems. As the war has progressed, the emphasis has shifted from one raw material to another.

In 1942, oil substitutions were the order of the day, but only China wood oil worried us. There were still unlimited amounts of maleic-treated linseed oil and all other types of linseed oil. In 1943, restrictions increased. Oil quotas were imposed, maleic oils disappeared, and modified phenolic resins were added to the list of unobtainable raw materials. In 1944, conditions became even more confused and complicated. While China wood oil again became available for civilian use, and linseed oil restrictions were slightly eased, all types of resin, including ester gum, were scarce or unobtainable. Modified phenolics were, however, available for a few months. Zinc oxide, chrome pigments, organic colors, and titanium pigments were under some type of restriction during most of the year. Now in 1945, the circle of restricted raw materials is complete as lead pigments and rosin have joined the group.

Raw materials offer a problem comparable to the logistics problems of the armed forces. Both our own operations and those of the Army deal with huge quantities of materials. "61" Floor Varnish, for example, requires 9,000 pounds of high grade resin each month; "61" Floor & Porch Enamel requires another 7,000 pounds; "61" Enamel White and "61" Q.D. Enamel White require 5,000 pounds, and Cellu-Tone requires 3,000 pounds. This adds up to 24,000 pounds or a carload of resin each month - but the resins in the various items are not interchangeable. Pigment consumption is equally impressive. "61" Q.D. Enamel White requires 4,000 pounds of pure titanium dioxide and 13,250 pounds of extended pigment monthly; "61" Enamel Gloss White requires 3,200 pounds and 10,750 pounds respectively of the same pigments. These two items alone consume a half carload of pigment per month.

The problem has been not only one of obtaining large quantities of raw materials, but also of obtaining a steady flow of the right

kind of materials so that formulas could be maintained for reasonable periods of time. Each month has brought its own jigsaw puzzle. Just how complicated this puzzle has been is best illustrated by the fact that "61" Floor & Porch Enamel had to be changed six times during 1944, "61" Q.D. Enamel Interior Gloss, Cellu-Tone, and Machinery and Implement Paint had to be changed four times each, and "61" Floor Varnish was changed twice. Work on formula changes due to raw material problems amounted to almost two-thirds of all the work done in trade sales items during 1944. In all, 306 changes were made in the 204 active items in our United States price list, and 265 changes were made in Canadian items.

During the first half of 1944, many oil changes were made in listed items as our dwindling stocks of maleic-treated linseed oil and perilla oil ran out. In the United States, Pittsburgh's #200 Selected Oil (the better drying fraction of ordinary raw oil) was substituted, and in Canada, a related product, Polymerol, was used. During the year, 135,000 gallons (17 tank cars) of the former product were consumed. Little change in cost or quality resulted from oil changes.

Resins offered the main raw material headaches in 1944. We bought other manufacturers' surplus stocks; we bought off-grade phenolics; we worked off dead stocks and obsolete resins in our own plant; but at no time were we able to keep more than one jump ahead of impoverished stocks. Only "61" Floor Varnish was spared from frequent change by carefully hoarding supplies of maleic and modified phenolic resins. Only two formula changes were made in this product during the year, and each change was for the better. "61" Floor Varnish is now virtually as good as it was before the war (through the use of good resins as well as China wood oil), but quality improvement has been attained at a sacrifice in profit. Other resin changes made during 1944 resulted in slightly diminished quality.

Probably the major new development among trade sales finishes during 1944 was an improved Solidex. This development eliminated the two most annoying defects that the product previously possessed - (1) a tendency to chalk off, and (2) the development of a pasty consistency in the package. Solidex represents big production. In the 22 months ending December 1944, since Solidex was first adopted, a quarter of a million gallons have been produced. In 1944, production (including Buffalo, Fort Erie, and Waggener) amounted to 135,000 gallons.

Other improvements in trade sales items made during 1944 included:

- (1) Lyt-all Flowing Flat Carribean Blue - lapping properties much improved, thus eliminating color variations in different parts of the same room.

- (2) Lyt-all Double Duty Primer - better drying
- (3) "61" Q.D. Enamel White - much better color and hiding
- (4) "61" Q.D. Enamel Tints - better gloss and "stay put" qualities
- (5) Lyt-all Gloss - better gloss
- (6) Effecto Primer - color changed from gray to white so that product would be more suitable under white and tints

In previous years, it has been possible for the laboratory to establish a money value on its work by showing the savings effected through formula changes. In 1944, most formula changes were made to keep production moving - and not to effect economies. In many cases, costs were kept constant; in others, costs increased. The only formula changes that saved us money were those which resulted from the enforced elimination of perilla oil. Savings from this source in 1944 amounted to \$6,500; on an annual basis, this would be equivalent to about \$9,500 savings. We will probably never return to the use of perilla oil, unless it is priced so low that we can ill afford to ignore it.

Post-war Problems

Approximately \$10,000 were spent on post-war problems during the year.

Work was concluded on a series of alkyd varnishes which are to be sold under the name "38" Pale Trim Varnish. These varnishes offer extremely pale color, good color permanency, and good drying.

Waxes of about the quality which we propose to market as "61" Paste Wax, "61" Liquid Wax, and "61" Rubless Wax, were developed and tested on a commercial basis. Little additional laboratory work seems warranted until decisions are made on equipment. Following the installation of wax-making facilities, considerable experimentation will have to be done with this equipment before wax can be made on a production basis.

A proposed formula for post-war Vitralite Enamel White was developed and tested at New York and Chicago. The best formula so far evolved is one which contains an experimental alkyd resin of our own make. Commercial resins have always produced inferior results. If we choose to produce Vitralite Enamel from our own resin, a new, costly, resin-making kettle will be necessary. Further work on resins has been suspended until a decision is reached relative to equipment. We cannot make a suitable white enamel resin in our present equipment.

An improved Effecto Enamel formula has been developed and is being exposed. Again the best results were attained with alkyds of our own make. The improved product dries in 4-6 hours, whereas our prewar formula dried in 12-18 hours.

An alkyd formula for "61" Floor & Porch Enamel is being subjected to exterior exposure tests. To date it is far superior to any product we have so far sold. Again, the resin is of our own development. The secret seems to lie in the production of an extremely hard alkyd by using pentaerythritol in place of glycerine.

An alkyd formula has been developed for sale under the "61" Q.D. Enamel White name. Stability and yellowing tests are now being conducted. The best resin is one of our own manufacture.

An alkyd formula for Lyt-all Stippling Eggshell was submitted to the Chicago Office for test, but was found to have faulty working properties. Whether the desirable features of this formula - good color permanency, a true eggshell gloss, and good serviceability - can be obtained along with good working seems debateable.

Considerable work has been done on undercoatings and primers, and while the results have been encouraging, no practical, tested, formulas are yet available.

Enthusiasm for the products described above should be restrained until presently unknown economic factors take shape. So far, alkyd formulations have always been more costly than oleoresinous formulations. We cannot afford to put out alkyd products if our competitors sell oleoresinous products. If alkyd finishes largely supersede oil base finishes in the post-war period, as now seems likely, and if selling prices are not increased, then our volume will have to expand appreciably or profits will decline. In any case, it seems unlikely that our products will be or can be enough superior to competing products to justify a wide gap between our prices and those of our competition.

Industrial Finishes

In presenting our company to prospective distributors, the laboratory is pictured as an important feature of Pratt & Lambert trade sales activities. The laboratory is an even more important feature of industrial selling, but few realize how large a proportion of the laboratory's work is devoted to industrial problems. The amount of work done by the laboratory for the direct benefit of the Industrial Sales Dept. is now three times as great as it is for all other sales divisions together. Prior to the war, the proportions were 65% industrial work and 35% trade sales work; in 1943, industrial work amounted to 67%; in 1944, it rose to 76%. These figures emphasize the extent to which the laboratory has been industrialized during the war period. Industrial problems are "short order" problems, and a far larger staff of specialists is required for their solution than is needed to solve trade sales problems.

Over half of all 1944 laboratory work on industrial finishes was confined to the following six fields:

<u>Industry or Type Finish</u>	<u>Total number Laboratory problems</u>	<u>Dollar value of laboratory work</u>
Aircraft	110	\$ 6,347
Wrinkle	138	5,084
Fabric coating	121	3,558
Tin plate and Collapsible tube	69	1,620
Paper coating	28	756
Casket	12	418
	478	\$ 17,783

In the aircraft field, zinc chromate primer continued to be a major problem and accounted for \$2,164, or a third of all the effort expended on aircraft work. In the three war years, \$8,651 have been spent on laboratory work on zinc chromate primer. During the same period, 162,150 gallons of the primer have been produced - 47,150 gallons of which were made in 1944.

A tremendous amount of work was done in developing 37 special dopes and enamels in a variety of colors to meet Army-Navy Specifications AN-D-1, AN-D-2, AN-D-3, AN-D-8, AN-L-21, AN-TT-D 551, and AN-TT-L 51. These products have been submitted for qualification tests, but actual business has so far been secured on only two items. One of these is Sea Blue Lacquer (AN-TT-L-51), of which 26,620 gallons have been produced; another is Sea Blue Dope (AN-D-2), of which 1,000 gallons have been produced. Both items were sold to Chance-Vought.

Another aircraft finish, developed in 1944, has sold in considerable volume, and that is Gloss Black Baking Enamel (for aircraft engines). 3,700 gallons were sold to Wright Aeronautical Corp.

Aircraft business - at least that part which relates to the Navy - carries with it the necessity for submitting highly complex qualification forms. These forms include detailed test data, production records, raw material information, and a certification that the product complies. It has been the laboratory's responsibility to complete 125 sets of these forms in 1944. The time expended on this clerical activity cost the company about \$3,100, and of course represents technically non-productive work. However, there is no alternative, if we take this type of business.

Wrinkle finishes represented the second largest class of industrial problems handled by the laboratory in 1944. The time spent on wrinkle finishes was equivalent to the full time of one formulator for the entire year. Much of this work was caused by raw material complications and was not concerned with the development of new accounts or better finishes. Early in 1944, China wood oil had to

be eliminated from wrinkle finishes; then phthalic-alkyds were denied for wrinkle finish end uses, and formulas had to be changed again; and finally a whole series of non-phthalic alkyds were developed.

Our company has an excellent reputation as a producer of wrinkle finishes and no small part of this reputation is due to the splendid service work which Mr. Hoffman has done in the field. About 60,000 gallons of wrinkle products were sold in 1944, but war uses seem to be declining. Several new accounts were opened toward the end of the year and the potential opportunities seem excellent. During the past year a line of post-war wrinkle products was developed for use on a 15-minute baking schedule at 250° - 300° F. Present finishes have to be baked a full hour at 250° F. Up to the present time, no one has ever offered a practical commercial air drying wrinkle finish, but there is some possibility that we will be able to produce such a product after the war. A novel wrinkle finish for cloth was developed during the past year.

Laboratory effort in the fabric coating field was doubled in 1944 through the transfer of employees from the alkyd enamel laboratory. This move proved to be a most helpful one in the end, although it seemed rather undesirable at the time. By familiarizing two new employees with fabric work, the effect of Mr. Hart's subsequent resignation was considerably lessened. In addition to the expansion of personnel on fabric coating developments, several new pieces of equipment were acquired at Mr. Avallone's request. These included a coating machine, an autoclave, and a wear tester. The latter device has never been used.

One item in the fabric coating field, Board Adhesive, 9711, developed in 1944, was produced in larger volume (100,000 gallons) than any other product of our manufacture. This adhesive is used in the production of Fiberglas insulation board for Navy ships.

A multitude of highly specialized coatings were developed for use with or on Fiberglas products during 1944. These ranged from a textile coating to permit the dyeing of glass cloth to an anti-itch solution which seals the raw edges of Fiberglas board and thus prevents skin irritation when the board is handled.

A series of coatings was developed for cotton conveyer belts during the past year, and approximately 1,000 gallons of these coatings were produced. Cotton conveyer belts are widely used by the food industry. Since fabrics deteriorate rapidly when they become wet, or when they are subjected to fruit and vegetable juices, the useful life of these costly cotton belts is greatly prolonged by surface coatings.

The biggest laboratory project in the fabric field during the past year was the development of Vinylite dispersions for use on upholstery and other artificial leather surfaces. A dispersion is unlike

the Vinylite solutions heretofore used in that it produces an acceptable surface coating only after considerable heat has been applied. Heat causes the dispersed resin particles to fuse together into a continuous film. Dispersions can be made at much higher non-volatile than solutions, thus permitting the production of thick films. They have the further advantage of containing inexpensive non-solvents, whereas Vinylite solutions contain costly active solvents. Samples of these dispersions were widely distributed during 1944 and considerable interest was shown in them, but no active business has thus far developed. It is doubtful whether this development can be capitalized upon, now that Mr. Avallone has left our employ.

Problems in the paper coating field are closely related to those in the fabric field and for that reason the Industrial Sales Dept. has been investigating paper coating opportunities. No volume purchaser has so far been established, but considerable research work has been done. Several heat-sealing lacquers were developed during the year. These lacquers serve a dual purpose - they improve the appearance and moisture proofing characteristics of paper, and they serve as adhesives when subjected to heat and pressure. An interesting coating for carbon paper was developed to prevent curling. One project - the coating of wallpaper to make it more washable - consumed considerable time, but in the end proved to be of no interest to wallpaper manufacturers. Surface coatings on wallpaper add to its cost and complicate manufacturing and hanging problems. Since style rather than quality determines the selling price of finished wallpaper, manufacturers view added cost factors with suspicion.

The metal decorating field, which includes tin plate and collapsible tube coatings, is one in which Pratt & Lambert also has an excellent reputation. Its problems are highly specialized, but competition is limited. In order to be in a better position to service metal decorators in the future, we have ordered about \$3,000 worth of new laboratory equipment for applying and testing coatings. This equipment will include a coating machine, a press with dies, and a thread rolling machine for knurling and threading bottle and jar caps. The purchase of this equipment was authorized in August 1944, but deliveries cannot be obtained until the middle of this year.

35,000 gallons of various synthetic finishes were sold in 1944 following the development of products to meet U. S. Army Specifications 3-171, 3-172, 3-173, 3-174, and 3-175. These specifications cover several types of automotive equipment primers and enamels.

As a result of limitations on the use of phthalic alkyds in 1944, an unusual non-phthalic finish was developed for hair pins. This product, Quick Baking Black, G27967, bakes in five minutes at 500° F. and was so interesting that an initial order for 20 barrels was received.

Among the post-war industrial developments now being worked on are several unique products. One is a "flash bake" primer that can be recoated after baking only three minutes at 150° - 180° F.; another is a really adherent primer for cadmium and zinc surfaces.

Expense

The overall cost of all laboratory operations was \$141,782 in 1944. This compares with \$139,928 in 1943, and \$142,728 in 1929. Labor accounted for \$116,878 of the total in 1944, \$112,776 in 1943, and \$113,172 in 1929. General expenses in 1944 was at a new low - \$24,904, nearly a quarter of which represents social security taxes. In 1929, expenses other than labor amounted to \$29,556, none of which represented taxes.

In terms of production, the laboratory cost the company 4.4 cents per gallon in 1944, which was the lowest unit cost recorded during the past fifteen years. In 1943, the comparable figure was 4.9 cents per gallon. In terms of sales, laboratory costs amounted to 1.5 cents per sales dollar, and again this was the lowest figure in fifteen years. The comparable figure in 1943 was 2.2 cents per sales dollar.

Over 40% of the cost of operating the laboratory has nothing to do with research or formulating but is directly concerned with production activities. A breakdown of this portion of laboratory expenses for 1944 is given below:

Finished Product Control	\$ 37,161
Inspection of Raw Materials for Factory	11,161
Small Batch Manufacturing for Factory	5,142
Manufacturing Problems	3,672
Complaint Investigations	<u>1,221</u>
Total	\$ 58,389

Of the remaining \$83,393 spent in 1944 on laboratory activities, about \$50,000 was devoted to the solution of special sales problems, many of which were caused by changing raw material conditions. The remaining \$33,000 was spent on research.

The amount of money which Pratt & Lambert is spending on real research is pitifully small. With the tax picture as it has been during the past year or two, we could easily support a much more extensive research program, but practical rather than financial considerations interfere. These considerations are discussed under "Personnel" (see below).

Personnel

There is now a nation-wide shortage of chemists which has been estimated to be as high as 25,000 persons. Few, if any, civilians now attending technical schools are available to industry as they invariably graduate directly into military service. Most unemployed chemists would not be acceptable for employment under normal conditions because of personality, ability, or physical shortcomings. Many unemployed chemists are political refugees, and while they may have been good chemists in their native lands, they do not fit our needs. Employed chemists are disinterested in changing jobs under present conditions unless the financial inducements be extremely attractive. Since the wages currently paid to our chemists are below the published national average, the hiring of new employees at higher rates would create trouble. Even though the latter factor did not exist, local War Manpower Commission regulations require that imported labor pass through its hands, which leaves no assurance that such labor would be routed to us. Selective Service rules now prohibit job shifts. In addition to all this, our own Buffalo plant labor quota is hovering around the bursting point.

The problem of doing more and better research work is therefore a complicated one. However, few of our competitors are any better situated than we are. We did hire two new male chemists late in December 1944. These men were the first such employees that we had been able to hire in four years. They had no prior paint experience, and therefore they are no match for the loss of Mr. Mehrhof and Mr. Hart. Mr. Mehrhof transferred to the Industrial Sales Dept. early in 1944 and Mr. Hart resigned early this year. Mr. Mehrhof was our most competent industrial formulator and his transfer was a serious loss to the laboratory.

Our laboratory's greatest current weakness is in its lack of first grade experienced chemists. It takes about five years' experience to develop an average college graduate to the point where he can do valuable independent work. Our need is for good men and not mediocre men if we are to match skill with our competitors in the post-war period. It is commonly recognized that ten second-rate research men are no substitute for one first-rate chemist, and our own wartime experience verifies this.

Labor turnover increased considerably in 1944 but was less than the turnover in 1942. Data on separations are tabulated below for the past three years.

	<u>1942</u>	<u>1943</u>	<u>1944</u>
Resigned	32	7	15
Transferred to other Depts.	2	2	3
Discharged	2	-	1
Laid off	-	-	1
Drafted or Enlisted	6	3	-
Total separations	<u>42</u>	<u>12</u>	<u>20</u>
Average number employees	55	47	48
Separation rate	76%	26%	42%

For the first time since the defense program got under way early in 1941, no personnel were lost to the armed forces. This is not too surprising as 14 laboratory employees are already in military service and only two men under 30 years of age now remain on the laboratory payroll. Both of these men were rejected by Selective Service for physical reasons. Twelve laboratory employees are presently deferred because of the essential nature of their work.

For some strange reason, over half of our labor turnover occurred in the three Summer months of June, July, and August. There were no separations between September 16, 1944, and the end of the year.

About two-thirds of all the persons who left the laboratory in 1944 averaged only three months service. The loss was therefore not one of skill or experience, but of wasted training effort.

Complaints

COMPLAINT RECORD

<u>Year</u>	<u>Total Complaints Reviewed</u>	<u>Per cent Justified Complaints</u>	<u>Complaint Index*</u>
1944	98	36	30
1943	102	27	35
1942	119	34	52
1941	175	27	66
1940	248	22	134

*Number of complaints per million
gallons manufactured goods

Last year, complaints again decreased. This coupled with an increase in production brought the complaint index to a new low for 1944. The only flaw in the picture is the percentage increase among justified complaints. No small part of this increase can probably be explained by the fact that wartime scarcities have eliminated the superficial complainer.

Of the 27 types of criticism levelled against our products in 1944, consistency, color, drying, and grittiness were most frequent and accounted for over half of all the complaints that were received and half of all the justified complaints. Consistency difficulties, alone, amounted to a fifth of last year's complaints and were more numerous than in any previous year. Consistency changes are of course a mark of package instability, which in turn is caused by the necessity for using any and all raw materials without adequate ageing tests. It is not surprising that we have this type of complaint; we have been fortunate in having so few of them.